INTERNATIONAL JOURNAL OF PLANT PROTECTION / VOLUME 5 | ISSUE 2 | OCTOBER, 2012 | 264-267

RESEARCH ARTICLE

Influence of bio-control agents and vermicompost on post harvest life of flowers and corm yield in gladiolus

■ AMIT PANDEY, ANJANA SISODIA AND ANIL K. SINGH*

Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, VARANASI (U.P.) INDIA

ARITCLE INFO

Received : 14.05.2012
Revised : 14.06.2012
Accepted : 26.07.2012

Key **W**ords :
Gladiolus,
Vermicompost,
Bio-control agents,
Post-harvest life,
Corm yield

*Corresponding author :
anilksingh_hort@rediffmail.com

ABSTRACT

A field experiment on gladiolus was carried out to see the influence of vermicompost and various bio-control agents on postharvest life of cut gladioli and corm yield. Treatment consisted of control, *Trichoderma harzianum*, *Pseudomanas fluorescens*, *Bacillus subtilis*, vermicompost, *Trichoderma* + *Pseudomonas*, *Trichoderma* + *Bacillus*, *Trichoderma* + vermicompost, *Pseudomonas* + *Bacillus*, *Pseudomonas* + vermicompost, *Bacillus* + *vermicompost* and *Trichoderma* + *Pseudomonas* + *Bacillus* + vermicompost. Experiment was laid out in a Randomised Block Design with three replications at Horticulture Research Farm, B.H.U., Varanasi. Maximum weight of spike at first day was recorded with *T. harzianum* + vermicompost. Whereas, *B. subtilis* + vermicompost registered maximum weight of spike at third day, sixth day, ninth day and number of florets open at a time. Application of *T. harzianum* + *P. fluorescens* + *B. subtilis* + vermicompost registered maximum length of spike at first day, third day, sixth day, ninth day, dry weight of spike, weight of spike after withering and diameter of corms. Maximum number of corms per hill was recorded with *P. fluorescens* which was significant to *T. harzanianum* + *P. fluorescens.* Maximum vase life was observed with *T. harzianum* whereas, maximum solution uptake was observed with *T. harzianum* + *P. fluorescens*. Aplication of *P. fluorescens* + vermicompost registered maximum number and weight of cormels per hill.

How to view point the article : Pandey, Amit, Sisodia, Anjana and Singh, Anil K.(2012). Influence of bio-control agents and vermicompost on post harvest life of flowers and corm yield in gladiolus. *Internat. J. Plant Protec.*, **5**(2) : 264-267.

INTRODUCTION

Gladiolus is very popular bulbous flowering plant grown throughout the world. It is native to tropical and southern Africa and belongs to family Iridaceae. Gladiolus with its majestic flower spikes having rich variations of colours and long vase life has ever increasing demand in the flower market. Vermicompost act as valuable organic manure and it is higher in content as compare to usual rural compost. Among bio-control agents, *Trichoderma harzianum, Pseudmonas fluorescens* and *Bacillus sultilis* occupy significant place for their antagonistic property against *Fusariun oxysporum* f. sp. *gladioli* causing *Fusarium* wilt of gladiolus. Beneficial effect of organic manure and bio-control agents has been well documented in various horticultural crops. Effect of vermicompost and bio-control agents on post-harvest life and corm yield of gladiolus has been reported earlier (Dubey and Singh, 2007 and Dongardive *et al*. 2009). In view of the above background, the present study was undertaken in gladiolus with the objective to find out the effect of vermicompost and bio-control agents on post-harvest life and corm yield of gladiolus.

MATERIALS AND METHODS

The present experiment was carried out at Horticulture Research Farm, Department of Horticulture, Institute of Agricultural Sciences, B.H.U., Varanasi. The soil of experiment

field was alluvial loam. The experiment was conducted on gladiolus cv. J.V. Gold with 12 treatment combinations consisted of control (without vermicompost and bio-control agents), *Trichoderma harzianum*, *Pseudomanas fluorescens*, *Bacillus subtilis*, vermicompost, *T. harzianum* + *P. fluorescens*, *T. harzianum* + *B. subtilis*, *T. harzianum* + vermicompost, *P. fluorescens* + *B. subtilis*, *P. fluorescens* + vermicompost, *B. subtilis* + vermicompost and *T. harzianum* + *P. fluorescens* + *B. subtilis* + vermicompost. Uniform and healthy corms having 4.5 cm diameter were selected for study. Corms were treated with various bio-control agents, whereas vermicompost was applied in the field and mixed properly. Experiment was laid out in a Randomised Block Design with three replications. Standard cultural practices were followed to grow successful crop. For post-harvest study gladiolus spikes were cut early in the morning, placed in the bucket containing water and brought in the post-harvest Laboratory for study. Spikes were again re-cut upto 0.5 cm and placed in conical flask containing vase solution (4% sucrose) prepared in distilled water. Observations on post-harvest life and corm yield parameters were recorded and subjected to statistical analysis.

RESULTS AND DISCUSSION

Application of vermicompost and different bio-control agents resulted spectacular response on various post-harvest parameters (Table 1). Maximum weight of spike at first day (47.07 g) was recorded with treatment *T. harzianum* + vermicompost which was statistically at par with *B. subtilis* + vermicompost (46.73 g), *T. harzianum* + *P. fluorescens* + *B. subtilis* + vermicompost (43.17 g), *P. fluorescens* + vermicompost (42.82 g), *T. harzianum* + *P. fluorescens* (41.97 g), vermicompost (40. 73 g) and significant to *T. harzianum* + *B. subtilis* (35.33 g). Maximum weight of spike at third day (55.00 g) was recorded with treatment *B. subtilis* + vermicompost which was statistically at par with *T. harzianum* + vermicompost (52.33 g), *T. harzianum* + *P. fluorescens* + *B. subtilis* + vermicompost (52.00 g), *P. fluorescens* + vermicompost (50.33 g), and significant to *T. harzianum* and *T. harzianum* + *B. subtilis*. Maximum weight of spike at sixth day (56.00 g) was recorded with treatment *B. subtilis* + vermicompost which was statistically at par with *T. harzianum* + *P. fluorescens* + *B. subtilis* + vermicompost (53.33 g), *T. harzianum* + vermicompost (53.00 g), *P. fluorescens* + vermicompost (52.33 g) and significant to treatments *P. fluorescens* + *B. subtilis*, *T. harzianum* + *B. subtilis* and *T. harzianum*. Similar to first, third and sixth days of observations, maximum weight of spike at ninth day (48.00 g) was recorded with treatment *B. subtilis* + vermicompost which was also statistically at par with *T. harzianum* + *P. fluorescens* + *B. subtilis* + vermicompost (46.00 g), *P. fluorescens* + vermicompost (45.00 g) and significant to treatments B. subtilis, *P. fluorescens* + *B. subtilis*, *T. harzianum* + *B. subtilis* and *T. harzianum*. Minimum weight of spike at various days of observations (third, sixth and ninth day) was recorded with control. Maximum length of spike at first day (68. 60 cm) was recorded with treatment *T. harzianum* + *P. fluorescens* + *B. subtilis* + vermicompost which was statistically at par with *P. fluorescens* + vermicompost (65.70 cm), vermicompost (65.00 cm), *T. harzianum* + vermicompost (63.00 cm) and significant

Table 1: Effect of bio-control agents and vermicompost on postharvest life in gladiolus

Treatment	Weight of spike at first day (g)	Weight of spike at third day (g)	Weight of spike at sixth day (g)	Weight of spike at ninth day (g)	Length of spike at first day (cm)	Length of spike at third day (cm)	Length of spike at sixth day (cm)	Length of spike at ninth day (cm)
Control	33.27	40.00	40.67	30.33	56.50	57.83	59.17	60.33
Trichoderma harzianum	36.82	44.00	44.50	35.00	59.33	59.83	60.67	62.67
Pseudomas fluorescens	40.12	48.00	48.33	40.00	62.33	63.00	65.00	66.67
Bacillus subtilis	38.39	46.00	47.67	39.00	61.17	62.00	61.83	63.33
Vermicompost	40.73	46.33	48.00	39.67	65.00	65.67	66.33	67.33
T. harzanium + *P. fluorescens*	41.97	48.67	49.33	41.67	61.33	61.67	62.00	62.83
T. harzanium + *B. subtilis*	35.33	43.00	44.00	36.33	58.50	59.33	60.00	60.67
T. harzanium + vermicompost	47.07	52.33	53.00	44.00	63.00	63.83	64.50	65.17
P. fluorescens + *B. subtilis*	37.50	44.67	45.67	35.67	61.22	61.83	62.20	63.00
P. fluorescens + vermicompost	42.82	50.33	52.33	45.00	65.70	66.33	66.67	68.00
B. subtilis + vermicompost	46.73	55.00	56.00	48.00	57.77	58.33	58.87	60.67
T. harzianum + *P. fluorescens* + *B. subtilis* + vermicompost	43.17	52.00	53.33	46.00	68.60	69.33	69.83	70.17
L. S. D. (P = 0.05)	10.80	10.63	9.97	8.74	10.85	11.13	11.41	11.36

to control. Maximum length of spike at third day (69.33 cm) was recorded with treatment *T. harzianum* + *P. fluorescens* + *B. subtilis* + vermicompost which was statistically at par with *P. fluorescens* + vermicompost (66.33 cm), vermicompost (65.67 cm), *T. harzianum* + vermicompost (63.00 cm) and significant to control. Maximum length of spike at sixth day (69.83 cm) was recorded with treatment *T. harzianum* + *P. fluorescens* + *B. subtilis* + vermicompost which was statistically at par with *P. fluorescens* + vermicompost (66.33 cm), vermicompost (65.67 cm), *T. harzianum* + vermicompost (63.00 cm). However, minimum length of spike at sixth day (58.87 cm) was recorded with treatment *B. subtilis* + vermicompost followed by control (59.17 cm). Maximum length of spike at ninth day (70.17 cm) was recorded with treatment *T. harzianum* + *P. fluorescens* + *B. subtilis* + vermicompost which was statistically at par with *P. fluorescens* + vermicompost (68.00 cm), vermicompost (67.33 cm), *T. harzianum* + vermicompost (65.17 cm). However, minimum length of spike at ninth day (60.33 cm) was recorded with treatment control (59.17 cm). Data presented in Table 2 shows that maximum dry weight of spike (4.23 g) was recorded with treatment *T. harzianum* + *P. fluorescens* + *B. subtilis* + vermicompost which was statistically at par with treatments

Table 2: Effect of bio-control agents and vermicompost on postharvest life in gladiolus

Treatment	Weight of spike after withering (g)	Dry weight of spike (g)	Maximum no. of florets open at a time	Solution uptake (ml)	Vase life (Days)
Control	18.97	2.79	4.33	49.67	9.11
Trichoderma harzianum	21.40	3.13	4.67	44.89	11.11
Pseudomas fluorescens	19.80	3.02	5.00	38.67	10.05
Bacillus subtilis	25.03	4.07	5.33	49.00	9.05
Vermicompost	28.13	3.80	5.67	44.33	9.55
T. harzanium + *P. fluorescens*	25.83	3.42	4.67	51.67	9.22
T. harzanium + *B. subtilis*	28.67	3.17	6.00	48.50	10.33
T. harzanium + vermicompost	25.13	3.57	5.67	40.22	10.33
P. fluorescens + *B. subtilis*	27.50	3.37	5.33	42.67	9.55
P. fluorescens + vermicompost	24.67	3.53	5.33	47.67	9.88
B. subtilis + vermicompost	24.50	3.10	6.33	44.22	10.33
T. harzianum + *P. fluorescens* + *B. subtilis* + vermicompost	30.67	4.23	5.67	38.00	11.00
L.S.D.(P = 0.05)	8.13	1.29	1.28	13.12	1.15

Table 3: Effect of bio-control agents and vermicompost on corm yield in gladiolus

Treatment	Number of corms per hill	Weight of corms per hill (g)	Number of cormels per hill	Weight of cormels per hill (g)	Diameter of corm (cm)
Control	2.34	33.54	17.74	2.29	3.87
Trichoderma harzianum	2.33	37.49	20.36	3.61	4.82
Pseudomas fluorescens	2.64	39.01	29.33	5.27	4.53
Bacillus subtilis	2.77	42.83	27.36	4.77	4.37
Vermicompost	2.45	36.83	34.22	4.46	4.34
T. harzanium + *P. fluorescens*	2.05	28.67	19.33	2.39	4.48
T. harzanium + *B. subtilis*	2.51	38.00	35.34	5.84	4.52
T. harzanium + vermicompost	2.63	34.72	19.30	2.29	4.53
P. fluorescens + *B. subtilis*	2.57	43.34	20.43	3.86	4.75
P. fluorescens + vermicompost	2.53	39.24	38.67	5.96	4.90
B. subtilis + vermicompost	2.48	36.37	25.73	4.04	4.70
T. harzianum + *P. fluorescens* + *B. subtilis* + vermicompost	2.50	36.87	28.56	5.00	5.10
L. S. D. (P = 0.05)	0.47	7.10	14.17	1.49	0.54

B. subtilis (4.07 cm), vermicompost (3.80 cm) and significant to control. Maximum weight of spike after withering (30.67 g) was observed with treatment *T. harzianum* + *P. fluorescens* + *B. subtilis* + vermicompost which was statistically at par with trearments *T. harzianum* + *B. subtilis* (28.67 g), vermicompost (28.13 g), *P. fluorescens* + *B. subtilis* (27.50 g) and significant to *B. subtilis*, *P. fluorescens, T. harzianum* and control. Maximum number of florets open at a time was recorded with treatment *B. subtilis* + vermicompost (6.33) which was statistically at par with *T. harzianum* + *B. subtilis* (6.00), *T. harzianum* + *P. fluorescens* + *B. subtilis* + vermicompost (5.67), *T. harzianum* + vermicompost (5.67) treatments and significant to *P. fluorescens, T. harzianum* + *P. fluorescens*, *T. harzianum* and control. Maximum vase life (11.11 days) was recorded with treatment *T. harzianum* which was statistically at par with treatments *T. harzianum* + *P. fluorescens* + *B. subtilis* + vermicompost (11.00 days), *T. harzianum* + *B. subtilis*, (10.33 days), *T. harzianum* + vermicompost ('10.33 days), *B. subtilis* + vermicompost (10.33 days) and significant to treatments *P. fluorescens* + *B. subtilis*, vermicompost, *T. harzianum* + *P. fluorescens*, and control. However minimum vase life (9.05 days) was recorded with treatment *B. subtilis.* Maximum solution uptake (51.67 ml) was recorded with treatment *T. harzianum* + *P. fluorescens* which was statistically at par with *B. subtilis* (49.00 ml), *T. harzianum* + *B. subtilis* (48.50 ml), *P. fluorescens* + vermicompost (47.67 ml) and control (49.67 ml). However, minimum solution uptake (38.00 ml) was recorded with treatment *T. harzianum* + *P. fluorescens* + *B. subtilis* + vermicompost. Beneficial response of vermicompost was due to availability of nutrients to the plants which resulted in more growth of plants and spikes. Combination of vermicompost and various bio-control agents probably augumented some role to control the common disease of gladiolus *i.e.* fusarium wilt and produced healthy spikes by which more vase life was observed. These results are in close conformity with those obtained by Gangadharan and Gopinath, 2000, Asrey *et al*., 2002, Godse *et al*., 2006 and Dongardive *et al*., 2009.

Data presented in Table 3 shows that maximum number of corms per plant (2.77) was recorded with treatment *B. subtilis* which was statistically at par with all the treatments except *T. harzianum* + *P. fluorescens*. Maximum weight of corms per plant (43.34 g) was recorded with treatment *P. fluorescens* + *B. subtilis* which was statitistically at par with treatments *B. subtilis*, (42.83 g), *P. fluorescens* + vermicompost (39.24 g), *P. fluorescens* (39.01 g) and significant to treatments *T. harzianum* + vermicompost, and control. However, minimum weight of corms per plant was recorded with treatment *T. harzianum* + *P. fluorescens* (28.67 g). Maximum number of cormels per plant (38.67) was recorded with treatment *P. fluorescens* + vermicompost followed by *T. harzanium* + *B. subtilis* (35.34), vermicompost (34.22) and significant to *P. fluorescens* + *B. subtilis*, *T. harzanium*, *T. harzianum* + *P. fluorescens*, *T. harzianum* + vermicompost and control. Maximum weight of cormels per plant (5.96 g) was recorded with treatment *P. fluorescens* + vermicompost which were statistically significant to *T. harzianum* + *P. fluorescens*, *T. harzianum* + vermicompost and control and at par with rest treatments. Maximum diameter of corm (5.10 cm) was recorded with treatment *T. harzianum* + *P. fluorescens* + *B. subtilis* + vermicompost which was statistically at par with treatments *P. fluorescens* + vermicompost (4.90 cm), *T. harzianum* (4.82 cm), *P. fluorescens* + *B. subtilis* (4.75 cm), *B. subtilis* + vermicompost (4.70 cm) and significant to other treatments. However, minimum diameter of corms (3.87 cm) was recorded with treatment control. Various post-harvest and corm parameters influenced by application of bio-control agent either alone or in combination or along with vermicompost. This pronounced effect might be due to healthy plants treated with bio-control agents who reduces disease incidence and resulted into increased number of corms, number of cormels, weight of corms, weight of cormels and also diameter of corms. Similar findings were made by Dubey *et al.* (2007) in gladiolus, who revealed that *T. viride* and *P. fluorescens* were effective for enhancing corms and cormels weight, number of cormels and diameter of corm.

REFERENCES

Asrey, Ram, Singh, R. and Kumar, S. (2002). Influence of organic manures and flower preservatives on postharvest vase life of gladiolus cut flower. *Ann. Agric. Res.,* **23**(4): 659-663.

Dongardive, S.B., Golliwar, V.J. and Bhongle, S.A. (2009). Effect of organic manure and biofertilizers on corms and cormels yield of gladiolus. *Ann.Pl. Physiol.,* **23**(1): 114-116.

Dubey, R.K. and Singh, R.S. (2007). Effect of *Trichoderma viride* and *Pseudomonas fluorescens* on corm and cormel production in gladiolus. *J. Ornamental Hort.*, **10** (3): 184-186.

Gangadharan, G.D. and Gopinath, G.D. (2000). Effect of organic and inorganic fertilizers on yield of spikes, corms, cormels and returns of gladiolus cv. White Prosperity. *Karnataka J. Agric. Sci.,* **13**(4): 937-941.

Godse, S.B., Golliwer, V.J., Chopde, N., Bramhankar, K.S. and Kore, M.S. (2006). Effect of organic manures and biofertilizers with redused doses of inorganic fertilizers on growth, yield and quality of gladiolus. *J. Soils & Crops,* **16**(2): 445-449.

****